



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/614,316

07/07/2003

Prateek Arora

16INC0159

8275

7590
Patrick W. Rasche
Armstrong Teasdale LLP
Suite 2600
One Metropolitan Square
St. Louis, MO 63102

11/14/2007

EXAMINER

GORADIA, SHEFALI DINESH

ART UNIT

PAPER NUMBER

2624

MAIL DATE

DELIVERY MODE

11/14/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/614,316

Applicant(s)

ARORA ET AL.

Examiner

Shefali D. Goradia (Patel)

Art Unit

2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 September 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. The amendment was received on September 4, 2007.
2. There were no amendments made to any of claims 1-8.

Response to Arguments

3. Applicant's arguments filed under Remarks (pages 6-14) on September 4, 2007 have been fully considered but they are not persuasive.

Applicants repetitively argue on pages 6-14 regarding the two limitations recited in the claims: 1) calculating mutual information...and 2) selecting a candidate image...

Applicants argue on page 7 stating:

"Applicants respectfully submit that Wyman at column 10, lines 5-47 does not include any reference to mutual information. Rather, Wyman describes that "the Image Comparison module 420 of one embodiment of the EIRS measures the Mutual Information for comparing images to determine whether or not they are aligned. Another embodiment further refines the computation of Mutual Information by using stochastic approximation techniques for sampling the image." Column 12, lines 5-10. As such, Wyman describes using mutual information to initially determine whether or not image sets (110 and 105) are aligned, and does not describe nor suggest calculating mutual information shared by each of the transformed candidate images and the reference image. In fact, Wyman teaches away from using mutual information for determining convergence as supported by the recitation that "because of the stochastic implementation used to calculate MI the measure is very noisy, making it impossible without the use of a large windowed low-pass filter to determine the point of convergence." Column 14, lines 51-56."

The examiner disagrees.

The image comparison in Wyman does meet the limitation of "calculating mutual information shared by each of the transformed images and the reference image." Wyman discloses aligning the current (candidate) image with the reference image to determine the comparison value – hence the mutual (matching) information. The image comparison module 420 discloses this step and therefore meets the limitation claimed. Wyman also DOES NOT teach away from mutual information as alleged by the applicant. However, Wyman discloses this at 14 starting at line 50 stating "FIGS. 9(A) through 9(F) illustrate the implementation of the

Art Unit: 2624

EIRS and the utility of the methods. FIG. 9(A) depicts the measurement of the mutual information (MI) over the iteration of the algorithm." This portion of Wyman clearly meets the claimed limitation of calculating mutual information by Wyman having the comparison unit.

Applicant further on page 7 argues stating:

"Furthermore, Applicants respectfully traverse the assertion on page 3 of the Office Action that Wyman describes "selecting a candidate image..." at column 10, lines 8-13, and that "the image that matches the most data is selected at step 450". Applicants respectfully submit that Wyman at column 10, lines 8-13 does not include any reference to mutual information or to selecting an image which shares the largest amount of mutual information with a reference image. Rather, Wyman describes that at step 450 "the registration process is complete and the aligned second image set is outputted from the ERIS." Column 10, lines 12-13...and does not describe nor suggest selecting a candidate image, which shares the largest amount of mutual information with the reference image...In fact, Wyman teaches away from selecting a candidate image, which shares the largest amount of mutual information with the reference image, from among the plurality of candidate images, by describing that a set of images is output at step 450."

The examiner respectfully disagrees.

Please note that at step 450 in the Figure 4 of Wyman the selected image is determined.

The image is being compared, transformed, and convergence has calculated in order to determine if the two images in question are aligned (has the most matching, comparison points) at step 450.

Please also see column 9 and 10 for the details of these steps especially col. 10 lines 5-13 and lines 41-47.

Applicant argues on page 8 stating:

"Moreover, Ayala does not describe nor suggest selecting a candidate image, which shares the largest amount of mutual information with a reference image, from among a plurality of candidate images."

The examiner has never admitted to this fact in the office action. The reference of Ayala is brought in for the limitation of "granulometry" and not to admit of disclosing the determination of the mutual information. Wyman in combination of Ayala discloses the limitations of claim 1, for example.

Applicant state on page 11 with regards to Nakajima:

Art Unit: 2624

“Notably, Nakajima does not describe nor suggest calculating mutual information shared by each of the transformed candidate images and a reference image. Further, Nakajima does not describe nor suggest selecting a candidate image, which shares the largest amount of mutual information with a reference image, from among a plurality of candidate images. Moreover, Nakajima does not describe nor suggest extracting a plurality of candidate images similar to a reference image from among a plurality of images by utilizing granulometry.”

Please note that Nakajima is brought in the rejection for “matching of magnification.” In Nakajima at (col. 14 lines 41 to col. 15 line 6) the positions are being adjusted by enlargement. This meets the limitation of claim 2 in combination with limitations of claim 1, which were met by Wyman in view of Ayala (as disclosed above).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, 3-5 and 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wyman et al. (US 7,106,891) (hereinafter, “Wyman”) in view of Ayala et al. (“Spatial Size Distributions: Applications to Shape and Texture Analysis,” IEEE, December 2001, pp. 1430-1442) (hereinafter, “Ayala”).

With regard to **claim 1** Wyman discloses an image processing method (Figure 4) comprising the steps of: extracting a plurality of candidate images similar to a reference image from among a plurality of images (col. 8 lines 62-63 receiving images from MRI 105 and CT 110, col. 7 lines 44-60); transforming the plurality of candidate images on the basis of the reference image (step 425 of transformation, col. 9 lines 31-42); calculating mutual information shared by each of the transformed candidate images and the reference image (steps 430 and 440, col. 10 lines 5-47); and selecting a candidate image, which shares the largest amount of mutual

Art Unit: 2624

information with the reference image, from among the plurality of candidate images (the image that matches the most data is selected at step 450, col. 10 lines 8-13). Wyman does not expressly disclose utilizing granulometry. Ayala discloses this on page 1430 2nd column lines 6-11 and under section 3 starting on page 1431. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the teaching of Ayala with Wyman. The motivation for doing so is to classify the image data (so that when MRI image (reference image) in Wyman is used to compare with the CT images (candidate images), the candidate images are classified by its patterns to find the closest match to the reference image) and to make a distinction by pattern analysis of the mathematical morphology as suggested by Ayala. Therefore, it would have been obvious to combine Ayala with Wyman to obtain the invention as specified in claim 1.

With regard to **claim 3** Wyman discloses transformation includes alignment of barycenters (Figure 5 and col. 10 line 48 to col. 11 lines 1-3).

With regard to **claim 4** Wyman discloses reference image and the candidate images are medical images (col. 7 lines 50-59).

Claim 5 recites identical features as claim 1 except claim 5 is an apparatus claim. Thus, arguments similar to that presented above for claim 1 is equally applicable to claim 5. Applicants' attention is invited to Figures 1, 3 and 6 where an apparatus for the method is illustrated.

Claim 7 recites identical features as claim 3 except claim 7 is an apparatus claim. Thus, arguments similar to that presented above for claim 3 is equally applicable to claim 7.

Claim 8 recites identical features as claim 4 except claim 8 is an apparatus claim. Thus, arguments similar to that presented above for claim 4 is equally applicable to claim 8.

6. Claims 2 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wyman et al. (US 7,106,891) (hereinafter, "Wyman") in view of Ayala et al. ("Spatial Size Distributions:

Art Unit: 2624

Applications to Shape and Texture Analysis,” IEEE, December 2001, pp. 1430-1442)

(hereinafter, “Ayala”) as applied to claims 1, 3-5 and 7-8 above, and further in view of Nakajima et al. (US 5,623,560) (hereinafter, “Nakajima”).

With regard to **claim 2** Wyman (modified by Ayala) discloses an image processing method as disclosed above in claim 1 and the arguments are not repeated herein, but are incorporated by reference. Neither Wyman nor Ayala expressly disclose having transformation include matching of magnification. Nakajima discloses this at col. 14 line 41 to col. 15 lines 1-6. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the teaching of Nakajima with Ayala and Wyman. The motivation for doing so is to have the reference and the candidate image be aligned for matching (please notice that Wyman does this correction by magnification also, however, by zooming out at col. 8 lines 9 and 25) as suggested by Nakajima. Therefore, it would have been obvious to combine Nakajima with Ayala and Wyman to obtain the invention as specified in claim 2.

Claim 6 recites identical features as claim 2 except claim 6 is an apparatus claim. Thus, arguments similar to that presented above for claim 2 is equally applicable to claim 6.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

Art Unit: 2624

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.


8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shefali D. Goradia (Patel) whose telephone number is 571-272-7396. The examiner can normally be reached on M-F 8:00am - 5:00pm (First Friday Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Werner can be reached on (571) 272-7401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Shefali D Goradia (Patel)
Examiner
Art Unit 2624

sdg



BRIAN WERNER
SUPERVISORY PATENT EXAMINER